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Wireless Data Networking Support Report: Public Safety Applications for Handheld Computing Devices

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Today, public safety agencies require comprehensive communications capabilities to support increased security and expanding mission requirements. To meet this requirement, the public safety community is leveraging unconventional mobile hand-held devices and commercial networks for mobile data applications. The Personal Digital Assistant (PDA) and the applications developed specifically for it for the public safety community expand communications capabilities for the public safety responder. Although the use of the PDA and industry-specific applications is not new, the practical use of these devices and the associated applications have become a reality for public safety only in recent years. The industry is developing specific applications for this vertical market that maximize the potential of the small device in the field.

Public safety responders demand on-scene, real-time access to valuable information such as—

- Wants and warrants
- Stolen property
- Vehicle registrations
- Driver's license information
- Weapon registrations
- Hazardous materials warnings
- Building floor plans
- Computer-aided dispatch (CAD) incident information
- Records management system (RMS) access.

With the advent of new wireless data technologies, the public safety community has implemented and adopted these technologies to alleviate congestion on the voice channels and relieve dispatch or communications personnel to concentrate on emergencies, thus increasing the efficiencies of the both field personnel and the dispatcher. Instant access to relevant information sources offers more than time savings; it ultimately supports public safety personnel safety needs and the safety of the public.

According to *PCTechGuide*, "It is generally accepted that UK technology company Psion defined the PDA genre with the launch of its first organizer back in 1984." This device has gained popularity among business consumers and the general public for keeping schedule calendars and address books. This paper highlights the use of PDAs and other current-generation handheld computing devices in conjunction with currently deployed public safety applications.

PDA Overview

A PDA is a handheld computing device that allows the storage, access, and organization of information. Most PDAs operate on either a Windows- or Palm-based operating system. In the United States, Microsoft Windows CE and Palm OS are the most popular PDA operating systems.

Specifications

PDAs can be screen or keyboard based, or both. The typical PDA has a built-in, miniature QWERTY keyboard (i.e., the standard typewriter and computer keyboard format for countries using a Latin-based alphabet) or an electronically sensitive handwriting pad with a writing instrument (e.g., stylus) for entering text, and a liquid crystal display screen that displays several lines of text and/or simple graphics. Other PDA manufacturers employ a Graffiti handwriting system. This method relies on a touch-screen and a simplified alphabet.

Capabilities

Basic PDAs allow you to store and retrieve addresses and phone numbers, maintain a calendar, and create to-do lists and notes. More sophisticated PDAs can run word processing, spreadsheet, money manager, games and electronic book reading programs, and also provide e-mail and Internet access. Some PDAs support stereo quality music and record voice memos, while some others can provide these capabilities with additional hardware.

Most PDAs can exchange information with a desktop or laptop computer, through wired or wireless connections, such as Infrared Data Association (IrDA), 802.11x, or Bluetooth technologies. IrDA established the open standard for short-range infrared data communications and is commonly used for synchronization of the PDA with a personal computer (PC). Often referred to as beaming, this technology allows the transfer of data between PDAs. This infrared communication involves transceivers (a combination transmitter and receiver) in both devices that communicate. Bluetooth, another common synchronization method, is a specification developed by the computing and telecommunications industry describing how wireless devices interconnect with each other using a short-range wireless connection. Both of these communications technologies require that the PDA support the capability with appropriate hardware and software resources.

Generally the following capabilities are considered standard for PDA devices:

- Alarm
- Address book
- Calculator
- Data synchronization mechanism
- Drawing application
- File manager
- Monthly/daily planner
- Printer connection
- Notepad
- To-do list.

In addition to these standard capabilities, the PDA now offers access to the Web via wireless connections to check e-mail and conduct Web searches, or to communicate with remote systems or databases.

A ruggedized PDA, shown in Figure 1, may be suitable for use in the field. The device is sealed for protection against rain and dust, and can withstand drops of up to 4 feet (1.2 meters). This model also features a built-in barcode scanner that could aid responders by quickly processing bar-coded drivers license and vehicle identification numbers (VIN) where available. Several other ruggedized models also support magnetic stripe readers.

Figure 1
Symbol Technologies Palm Compatible Barcode SPT1800

Public safety agencies generally use commercially provided air interfaces (e.g., cellular digital packet data [CDPD], general packet radio service [GPRS] or PalmNet) for transport of data. CDPD, a common protocol used by public safety agencies, allows wireless access to the Internet and other public packet-switched networks. Access rates for mobile users are approximately 19.2 kilobits per second (Kbps). GPRS is a packet-based overlay on a global system for mobile (GSM) communications system. This 2.5-generation technology projects initial data rates at 30–40 Kbps. PalmNet, a service provider for Palm devices, offers data rates at 8–19.2 Kbps. Information obtained from several public safety application vendors indicates that access opportunities for private radio networks is forthcoming to allow PDA devices to operate on existing wireless data networks that also support mobile data computers (MDC).

When considering the use of PDAs and associated applications, public safety officials should be aware that the system-level performance should be consistent with the following functional requirements:

- Coverage and network availability—percent coverage of and within a given geography. In-building coverage may also be important for so applications especially in the fire services
- Suitability for mission-critical transactions (e.g. CAD transactions, unit status, resource alerting, emergency medical triage assessment and reporting, and law enforcement wanted or stolen vehicle queries)
- Opportunities for priority access to network resources
- Ability for priority restoration and recovery
- Application functionality, operation, and ease of use
- Service accessibility, capacity, and transaction time—expected traffic profiles for user community

- Interoperability—general classes of interoperability by user category and type of responsiveness required

- Security—encryption standards supported, agency and/or proprietary network (e.g., National Crime Information Center [NCIC]/National Law Enforcement Telecommunications System [NLETS], and state systems) specific considerations and requirements

- Training requirements—Operations training for both the hardware devices and the software applications

- Other factors such as reliability, availability, operations and maintenance, and response times.

Public Safety Applications

Numerous public safety applications have been or are being developed. These applications offer the field user access to agency-specific databases, other information sources, as well as software designed to meet the demands of a specific activity. The following applications are examples of some of the offerings available to the public safety community.

PocketCop

In July 2000, Public Safety Group, Inc., introduced the PocketCop, a law enforcement application that provides access to federal, state, and local databases, and secure text messaging and e-mail. Expanding services beyond the traditional patrol car assignment, this "crime fighting e-tool" offers greater mobility than a ruggedized laptop and is well suited for bicycle, motorcycle, and mounted police patrols, as well as other unique, mobile law enforcement activities. Currently, PocketCop works with any Palm-enabled or Windows CE device and uses either 3Com PalmNet or a CDPD wireless network to transport data. To provide secure communications between the handheld device and the agency's server, various encryption methods can be applied. Shown in Figure 2 is a PDA with the PocketCop application introduction screen.

Figure 2
PDA with PocketCop Application

The Highland Park Police Department was one of the initial law enforcement agencies to embrace the technology. Highland Park is a suburb located within the City of Dallas, Texas, and has a sworn force of 52 officers. Currently, four devices with the PocketCop software are active in the field. Department representatives indicate that the technology enhances the productivity of field units by allowing real-time retrieval of information from law enforcement databases and providing storage capacity for that information using the standard notebook feature. In addition, the product's address book and calendar functions are well used by specialized units within the department.

The Public Safety Group has developed other product offerings similar to PocketCop but are scoped for a particular mission. For example, PocketPDC (Profile Data Collection) assembles profiling or demographic information, including location, subject description, vehicle information, and disposition, to assist agencies attempting to identify racial profiling patterns. PocketIncident, another application, is used for abbreviated field reporting.

PocketCop, costs approximately $2,500, generally less expensive than most MDCs installed in patrol cars. Depending on the user requirements, law enforcement agencies may determine that these devices are applicable for some missions. For additional information regarding PocketCop, log onto www.psginc.cc/

PocketFD

In October 2001, Aether Systems introduced PocketRescue, a wireless mobile application for fire services. This application, renamed PocketFD, allows fire services personnel to query and update records in the field, wherever CDPD or Cingular Wireless network coverage is available. PocketFD employs a standard Web browser and operates on a variety of handheld devices including those from Palm, Symbol, and RIM. It is also supported on devices using the PocketPC operating system, and Wireless Application Protocol (WAP) enabled cellular telephones. The FireRMS 5.0 enterprise edition, an RMS provided by Aether, is required. E-mail capabilities are included if the user is equipped with a Blackberry enabled RIM device, as shown in Figure 3.

Figure 3
PocketFD on RIM PDA

PocketFD may be well suited for fire service activities such as fire prevention, code enforcement, and administrative functions. The application allows the user to enter relevant information in real time and eliminates the need for reentry when returning to the office. Detail-intensive assignments, such as code enforcement, may also benefit from the paperwork retrieval capabilities of PocketFD. In addition, fire personnel charged with administrative duties may also benefit from the query functions provided by PocketFD. Standard information retrieval is available for location occupancy data, on-duty personnel rosters, personnel training and certifications, and fire hydrant capability information.

As noted on Mobileinfo.com, fire agencies in Garland, Texas, and Broward County, Florida, are beta testing the application. Aether Systems representatives have indicated that an awareness campaign is being planned to launch an industry-wide introduction.

Aether Systems also has other public safety applications including PocketBlue, a mobile data tool, and StopTracker, a demographics collection tool, available for the law enforcement agencies. Additional information regarding Aether Systems and PocketFD can be found at www.aethersystems.com.

Voyager™

Voyager Systems, Inc., formally TriTech Secure Data Solutions' of San Diego, California, has introduced a robust suite of secure wireless data applications that enable public safety personnel to access local, state, and federal criminal justice databases , as well as CAD systems, collect and report field contact information, and generate citations. The Voyager product suite operates on virtually any handheld computing device or PC and communicates over public wireless networks. The Voyager applications are designed as cost-effective, secure alternatives or complements to traditional wireless mobile data systems. The Voyager application extends data access and reporting capabilities to law enforcement officers who do not have regular access to MDCs, either because their assignments are discreet (i.e., detectives) or not vehicle-based (i.e., community policing foot patrols, bike patrols, motorcycle units, horse patrols, beach patrols, etc.), or because agency budgets do not permit their acquisition.

Currently deployed applications in the Voyager suite include Voyager Query™, Voyager Contact™, Voyager Encounter™, Voyager Citation™, and Voyager CADLink™. To test the application in a robust field community, Voyager Systems is participating in the Federal Bureau of Investigation's (FBI) Wireless Applications Test Program (WATP), an initiative through which the FBI seeks to identify innovative wireless mobile products to support law enforcement activities.

The Voyager Query application enables federal, state, and local law enforcement personnel to securely query local, state, and federal criminal justice databases. Queries are also supported for driver's license and vehicle registration information through home state message switching systems and through NLETS. Serial number inquiries for firearms and other common property queries are also supported for State and NCIC stolen property systems. Voyager Query also can support information queries with AutoTrackXP® from ChoicePoint® to provide public record identity verification, address, and telephone number information.

Voyager Contact is a powerful data collection and query tool that streamlines the process of collecting field interview and traffic stop informationIt collects standard contact information regarding the initiation of the call service, including the alleged infraction, identifying characteristics of the individual with whom contact was made, whether a warning or citation was issued, and similar details necessary for contact demographics analysis. The application permits the linkage of information returned from the associated records check conducted through Voyager Query, and permits the secure transmission and storage of the information in a centralized database for analysis and reporting by the user agency. The Voyager Contact application was successfully deployed and used in various activities at the 2002 Winter Olympics in Salt Lake City by more than 200 law enforcement personnel.

Voyager Encounter is an application tool for recording and reporting of contact demographic information to support racial profiling analysis. It provides a template for recording of information relating to vehicle and pedestrian stops. Officers use handheld devices to complete entries relating to the gender, age, and race of the contacted person, the primary reason for the contact and details relating to any search and the disposition. Similar to Voyager Contact, Voyager Encounter transmits the collected data to a centralized database where it is immediately available to command staff for review and reporting.

Voyager Citation allows the automatic generation of citations from a handheld device. Citations can be printed on scene and transmitted immediately to the user agency's collection system for processing. Depending on the electronic capabilities of the associated court system, citations can also be transmitted simultaneously for court action. Additionally, the application supports automatic wanted person, stolen vehicle, and related databases queries. This product enables officers to process tickets more quickly and significantly shortens the collections cycle by providing the offender with the ability to pay the ticket online in just minutes from the time of the offense. Voyager Citation can be used for both parking and moving violations.

These applications support a priority alert system that immediately notifies the agency's dispatch center of stolen vehicles or warrants. This timely information better protects officers from potentially hazardous situations.

The Voyager product suite uses Advanced Encryption Standard (AES) to encrypt all information prepared for transmission. This end-to-end encryption ensures that data is secure at all points along its path regardless of any conversions made on the packets or the networks used for delivery. Robust user authentication and transaction logging are also a part of the application security structure. The purpose for such stringent authentication routines is to prevent unauthorized use if a Voyager unit is lost or stolen and to prevent interception of messages as they travel along public networks.

Most searches begin returning information to any Voyager device in less than 10 seconds—regardless of network speed. Store-and-forward host architecture ensures that users receive the requested data even when they are experiencing spotty wireless coverage or are forced to shut down their handheld device and return to the application later.

Voyager CADLink provides an administrative view into the TriTech VisiCAD Command™ system for supervisory purposes of checking units, pending incident queues, and incident status; sending notification pages; and accomplishing various other CAD-related functions. Voyager CADLink was originally developed as an application for the TriTech VisiCAD CAD product only, but the architecture now permits the use of the CADLink on any vendor's CAD system.

The Voyager applications are generally device and network neutral; they operate on the following handheld devices and networks—

Devices

- All Palm, Inc., devices
- All Palm Operating System licensee products, including the Handspring Visor, TRG, and Symbol Technologies devices
- Research in Motion (RIM) 850/857/950 and 957 Blackberry devices
- Palm-enabled Smartphones from Kyocera, Samsung, and Handspring
- Handheld PCs using Microsoft Pocket PC or Windows CE operating systems, including the HP Jornada, Compaq iPAQ, and various Casio devices
- Handheld computers, notebooks, laptops, and desktops running Windows, Macintosh, or Linux operating systems
- Java-capable telephones from Motorola/Nextel
- CDPD capable devices supporting WAP
- Two-way pagers such as the Motorola Accompli
- GPRS telephones
- Qualcomm's OmniExpress MDCs

Networks

- Cellular networks, including the emerging Sprint third generation personal communications system network
- CDPD network
- Cingular Mobitex and PalmNet networks
- Reflex network
- Motient network
- Time division multiple access networks
- Nextel iDEN network
- 802.11 and wired local area networks
- Satellite networks.

Present users of Voyager applications include, the Bellevue, Washington, Police Department, the Acadia, Louisiana, Parish Sheriff's Office, San Diego Fire Department and Life Safety Services, Shawnee, Oklahoma Police Department and several Federal law enforcement agencies. Additional information can be obtained from Laura S. Lee at Voyager Systems, Inc., (858) 799-7395, or www.voyagersystemsinc.com.

Premier Handheld™ and Premier 2Way™

Motorola has introduced two mobile applications, which extend wireless access to PDAs and two-way paging devices. Premier Handheld is a mobile software application that provides law enforcement personnel with wireless access to local, state, and national criminal justice database systems. Premier 2Way provides the same capabilities, but on a two-way paging device. The applications support—

- Name and driver's license queries
- VIN and license plate queries
- Access to local warrants systems and/or an RMS
- Traffic citation completion and issuance
- Real-time messaging between other fixed or wireless clients and the CAD system.

Both Premier Handheld and Premier 2Way support secure access through an authentication process that includes login IDs and passwords. Encryption is supported to provide secure communication of all data transmissions and to preclude the potential of unauthorized interception. The devices can also be automatically logged off after a specified period of time.

The Premier Handheld mobile application is supported on the Symbol Technologies SPT1733 and can incorporate a barcode reader to facilitate automatic entry of one-dimensional barcode data, such as VIN or driver's license numbers. The application is also certified to operate on a Palm Vx PDA and the Compaq IPAQ. Both the Symbol and Palm devices require a CDPD modem for wireless access. The Premier 2Way application is supported on the RIM 950 Wireless Handheld two-way pager.

According to information from Motorola, it is anticipated that a DataTAC modem for Windows CE based handheld devices will be available in the fourth quarter of 2002. This modem will allow the concurrent use of the Premier Handheld device and applications with existing MDCs operating on Motorola's private wireless data networks.

Presently, Motorola has begun testing the Premier Handheld applications with the Illinois State Police and the Chicago Police Department. The Houston, Texas, Police Department is currently deploying a Premier Handheld application to facilitate traffic citation completion, in-field printing, and issuance. For additional information regarding Motorola applications for small devices, log on to the Web at www.motorola.com.

Future Outlook

Public safety application requirements are increasingly combining emerging wireless telecommunications technologies and data transmission capabilities. As the technology continues to evolve, more affordable and efficient wireless handheld devices and off-the-shelf applications will likely play a greater role in public safety communications.

Many public safety agencies are employing non-traditional vehicles, such as motorcycles, bicycles, and all-terrain vehicles, as well as more pedestrian patrols in concert with community-based policing initiatives. All personnel involved in these alternative mobilization efforts

continue to require the same or extended wireless data communications capabilities as those provided to traditional vehicle-based personnel.

Public safety agencies are benefiting from using these small devices to provide extended information query and collection opportunities previously unavailable or only available through vehicle-mounted equipment. These approaches will create time and potentially monetary savings by allowing users in the field to query and receive time-sensitive information, and to collect reporting information in real time, all in a wireless environment. Additional benefits may include the elimination of redundant tasks for communication center dispatchers and records management personnel, and more efficient use of voice communications resources.

Potential areas of expansion of handheld wireless technologies may include support for field-based biometrics capture and comparison. Ultimately, these capabilities will be driven by the ability of a handheld device to capture biometric information from fingerprints, facial scans, retinal/iris scans, or other biometric samples, and the development of the required repository databases. This field-captured information would be wirelessly transmitted and compared to records in repository databases providing timely, positive identification of the subject in question.